DOCUMENT RESUME

ED 171 803 TM 009 515

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TITLE The Advance Organizer: A Review of Research Using Glass's Technique of Meta-Analysis.
PUB DATE Apr 79
NOTE 16p.; Paper presented at the Annual Meeting of the American Educational Research Association (63rd, San Francisco, California, April 8-12, 1979)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Advance Organizers; Age Differences; Comprehension; Educational Research; Elementary Secondary Education; Higher Education; Intellectual Disciplines; *Learning; Research Design; *Research Needs; *Retention; Student Ability; *Success Factors
IDENTIFIERS Effect Size; Glass (Gene V); *Meta Analysis

ABSTRACT

Using Glass's meta-analysis, of which "effect size" is the fundamental measure, 135 research studies on Ausubel's advance organizer theory were reviewed to determine its effect on learning and retention. Variables, such as grade level, subject area, organizer presentation mode, and ability level were also examined. In most of these studies advance organizers are shown to have a facilitative effect on learning and retention. Advance organizer effect on retention increases with time in relation to the control group. Learning is shown to be more pronounced in college and special education subjects than in primary or secondary school subjects, while primary school subjects show a greater retention increase. Within subject areas, average effect size of the advance organizer on learning and retention is positive, especially in the social sciences for learning and in the physical sciences for retention. For subjects of high ability, the average effect size exceeds that for low ability subjects. Aural mode advance organizer studies show a greater average effect size than written mode, especially for college level subjects. (MH)

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The Advance Organizer: A Review of Research Using Glass's Technique of Meta-Analysis

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Presented At American Educational Research Association
Annual Meeting, San Francisco, 1979, Session Number 30.04

TM009 515

Over the years, dozens of studies have appeared in the literature claiming to have tested an Ausubelean organizer (Ausubel, 1963) in one experimental setting or another. Many of these studies have yielded seemingly contradictory results. In a variety of studies (Ausubel, 1960; Scandura and Wells, 1967; Allen, 1969), the use of an advance organizer has been shown to produce a statistically significant increase in learning and retention. Other studies (Bauman, Glass and Harrington, 1969; Barron, 1971; Feller, 1973), have failed to reproduce these findings.

A previous review of the literature by Barnes and Clawson (1975) used a variate of the "voting technique" in which 32 advance organizer studies were classified into those finding statistically significant results and those finding statistically nonsignificant results. A nonsignificant result was invariably interpreted by Barnes and Clawson as a finding against the facilitative effect of the advance organizer. Nonsignificant studies outnumbering significant ones in their review, Barnes and Clawson concluded that ". . . advance organizers as presently constructed, generally do not facilitate learning."

The authors of this paper are of the opinion that the lack of a statistically significant finding in favor of the advance organizer treatment group in many studies does not necessarily indicate that the advance organizer had no facilitative effect. Rather, failure to obtain statistically significant differences among treatment groups in many studies may be due to a variety of other causes (small number of subjects, short duration of treatment, low reliability of measuring instru-

ment, etc.) as well as a genuine lack of advance organizer effect.

A major problem with the voting technique used by Barnes and Clawson is that it does not take into account any positive treatment effect which fails to reach the criteria of statistical significance. Indeed, the opposite is true. Studies showing positive, yet statistically nonsignificant, effects are grouped together with those studies showing statistically significant or nonsignificant negative effects. The results of a review of this type are clearly biased against a favorable finding.

Glass (1978) proposed a technique that he termed Meta-Analysis by which treatment effects may be quantified, standardized, and compared across studies. The fundamental measure in Meta-Analysis is the "effect size" statistic (E. S.). The formula suggested by Glass is:

$$E.S. = \frac{\bar{X}_t - \bar{X}_c}{S.D._c} .$$

Where: $\bar{X}_t$ = Mean of Treatment Group
$\bar{X}_c$ = Mean of Control Group
$S.D._c$ = Standard Deviation of Control Group.

The effect size is a standardized measure of treatment effect which may be used to describe the results of a single study or averaged across several studies of similar type to provide a composite figure. Notably absent in Glass's technique is the concept of a statistical test for significance of the effect size. All effect sizes, regardless of magnitude, are worthy in their own right. In this way, the bias of the voting technique is avoided and the detection of small, but consistent treatment effects is made possible across studies.

METHOD

The research literature reviewed for this paper consisted of approximately 170 published as well as unpublished advance organizer studies, including 75 doctoral dissertations, covering the period from 1960 to 1979. Not all of these studies were unique, e.g., some dissertation studies were later presented at national conferences or published as journal articles. Whenever several references to the same study were obtained, all were examined, and the one containing the most experimental information selected for review. In this respect, dissertations were usually the most profitable and journal articles the least. In addition, twelve references were not obtainable by the authors for review making the total number of studies reviewed for this paper 135.*

In each of the studies reviewed, the most important feature considered was the magnitude of the effect of the advance organizer on learning and retention. Following Glass's suggestions, this magnitude was expressed in terms of the effect size statistic (E. S.). In this way, the 135 studies reviewed yielded 110 effect sizes for learning and 50 effect sizes for retention (most studies reviewed did not attempt to measure retention).

Subsets of these studies were selected and their effect sizes averaged to examine the effect of advance organizers on learning and retention. In addition, possible influencing variables such as grade level, subject area studied, organizer presentation mode, and subject ability level were examined in a similar manner.

*A complete Bibliography of these studies can be obtained upon request from the authors.

In some of the studies reviewed, effect sizes were impossible to compute because these research reports lacked the necessary means and standard deviations. A few studies contained more than one treatment group or contained multiple experimental situations and, therefore, yielded more than one effect size. Of the total number of studies yielding learning effect sizes, sixteen produced more than one effect size. For retention studies, eleven produced multiple effect sizes.

RESULTS

The average effect size for advance organizers on learning and retention is shown in Table 1.* In the overwhelming majority of studies reviewed, knowledge acquisition was measured immediately after subject completion of the material to be learned. For the purposes of this review, all studies in which a measure of knowledge acquisition was taken within 24 hours after completion of material were combined to examine the effect of the advance organizer on learning. If two or more measures of knowledge acquisition were taken within 24 hours, only the first was used. Subsequent measures (more than 24 hours) of subject knowledge were defined as retention.

Insert Table 1 Here

The data presented in Table 1 show advance organizers to have a

*The standard error of the mean is included in all tables presented solely to provide the reader with a feeling for the variation of the effect size statistic. It is not the intention of the authors to test the statistical significance of the effect size.

facilitative effect on learning and retention in the average study reviewed. Smith and Glass (1977). assuming a normal distribution of subject scores, have proposed the following interpretation for the average effect size: "The average study showed a .68 standard deviation (E. S.) superiority of the treated group over the control group. Thus, the average client receiving therapy was better off than 75 percent of the untreated controls." Using the Smith and Glass interpretation, the mean effect size for the advance organizer on learning (.21) would indicate that the average subject receiving the advance organizer treatment performed better than 58 percent of the control group subjects. A similar statement can be made for the average effect size at each retention interval shown in Table 1. Interestingly, the retention data show the advance organizer effect to increase with time in relation to the control group. It should be noted, however, that the majority of studies reviewed used identical instruments to measure both learning and retention.

To examine the influence of grade level on learning and retention, advance organizer studies were regrouped into four categories: college, secondary, primary, and special education. Table 2 shows the average effect size for advance organizers on learning and retention when classified by grade level.

Insert Table 2 Here

The average effect size for studies using college and special education subjects can be seen to be greater than that of studies

employing secondary or primary school subjects. In studies of retention, however, this situation is reversed with primary school subjects showing the largest average effect size. Whereas Table 1 seemed to indicate an average effect size increase for all subjects at longer retention intervals, it can be seen in Table 2 that this effect size increase in retention is most pronounced for the primary grades, smaller at the secondary level, and non-existant at the college level.

Table 3 shows the effect of the advance organizer on learning and retention when studies are classified by subject area taught. In this table, studies are divided into four content areas: Mathematics (statistics, algebra, trigonometry, physics), Physical Sciences (chemistry, geology, metallurgy, astronomy), Biological Sciences (plant and animal biology, microbiology, ecology), and Social Sciences (religion, psychology, geography, economics, civics, art, language).

Insert Table 3 Here

Within all subject areas studied, the average effect size of the advance organizer on learning and retention was positive. In learning studies, the largest average effect size was in the Social Sciences, while in retention studies, the Physical Sciences showed the largest average effect size. In retention studies, Mathematics, Physical Sciences and Biological Sciences all showed an increased average effect size, while the Social Sciences declined.

The interaction of the advance organizer with subject ability is shown in Table 4. Because of the small number of studies examining

subject ability and retention, this table presents the average effect sizes for learning studies only.

Insert Table 4 Here

Although it is the impression of many researchers that advance organizers should be most effective with subjects of low ability, this conclusion is not supported by the data. Table 4 shows that subjects who were defined as high ability had an average effect size almost twice that of low ability subjects. The reader should keep in mind, however, that there is a great disparity among studies in their operational definitions of high, middle and low ability.

In the great majority of studies reviewed, advance organizers were presented to the subject in written form. Subjects were required to first read the advance organizer passage and then complete the material to be learned. Some studies have attempted to deviate from this pattern by presenting the advance organizer to the subject in other than written form. Table 5 shows the average effect size of the advance organizer on learning when studies are classified into written and aural advance organizer presentation modes.

The category of aural presentation contains four studies not exclusively aural. In one study the subjects read the advance organizer passage while listening to the instructor read it aloud and in three others, an audio-visual (slide projector or movie) presentation of the advance organizer was used. Studies varying organizer presentation mode as well as measuring retention were so few in number that they are

not presented in Table 5.

Insert Table 5 Here

Table 5 shows the average effect size for aural mode advance organizer studies to be twice that of written mode advance organizer studies. In an attempt to explore this relationship further, aural mode advance organizer studies were classified by grade level. The results are shown in Table 6.

Insert Table 6 Here

For college level subjects, an aural mode of advance organizer presentation produces an average effect size approximately three times that of the written mode. For primary level subjects, the average effect size doubled. Only secondary level subjects showed a decrease in average effect size for aural mode advance organizer presentation.

DISCUSSION

Barnes and Clawson (1975) concluded their review of advance organizer research with several recommendations for further study. Four of these have been addressed in part by this paper.

1. "Studies should be conducted to determine the long-term effects of advance organizers."

Long-term effect studies of advance organizers are few in number. No study reviewed in this paper measured subject retention

longer than fifteen weeks after learning. However, a great number of studies have measured subject retention within the first four weeks after learning. These studies show a trend across time for the effect size to increase rather than decay. This would seem to indicate a permanent advantage stemming from the advance organizer treatment rather than a short term "warm-up" effect.

2. "Studies should be conducted with students of high ability provided that the organizers are operationally defined and that the studies last for more than ten days."

Barnes and Clawson make this recommendation based on a finding of "inconclusive" results for the effect of advance organizers on high ability subjects. The data presented in this paper indicate advance organizers to be effective with subjects of all ability levels and most effective with high ability subjects. This is basically in agreement with Barnes and Clawson's three significant findings versus four nonsignificant findings for studies using high ability subjects.

3. "Studies should be conducted at all grade levels . . . (to) lead to an eventual isolation of age or grade level as a significant variable."

The results of this review show grade level not only to be an influencing variable on learning and retention, but also to interact with the presentation mode of the advance organizer.

4. "Studies using a wide variety of nonwritten advance organizers that are operationally defined and constructed according to general criteria espoused by Ausubel should be conducted."

Although studies utilizing games, visual, and graphic advance organizers were too few in number to be studied by a meta-analytic

review, aural presentation studies appeared quite frequently and on the average show a much greater effect size than studies using only a written presentation mode for the advance organizer.

CONCLUSION

This review cannot answer all of the questions that have arisen concerning the use of advance organizers in the facilitation of learning and retention. Many of these questions as well as a number of recommendations for further research have been excellently summarized by Lawton and Wanska (1977) and will not be repeated here. Rather, it is the intent of the authors that this paper consolidate many of the established research findings concerning the facilitative effect of advance organizers on learning and retention called into question by the Barnes and Clawson review. Hopefully, the authors of this paper have succeeded and, thereby, indeed future researchers to investigate many of the still unanswered questions concerning advance organizers.

REFERENCES

Allen, D.I. Some effects of advance organizers and level of retention of written social studies material. (Doctoral dissertation, University of California, 1969).

Ausubel, D.P. The use of advance organizers in the learning and retention of meaningful verbal material. Journal of Educational Psychology, 1960, 51, 267-272.

Ausubel, D.P. The psychology of meaningful verbal learning. New York: Grune & Stratton, 1963.

Barnes, B.R., & Clawson, E.V. Do advance organizers facilitate learning? Recommendations for further research based on an analysis of 32 studies. Review of Educational Research, 1975, 45, 637-659.

Barron, R.R. The effects of advance organizers upon the reception of learning and retention of general science content (Final report). Department of Health, Education, and Welfare, Project No. 1B-030; Grant No. OEG-2-710030, November, 1971. (ERIC Document Reproduction Service No. ED 061 554).

Bauman, D.J., Glass, G.V., & Harrington, S.A. The effects of the position of an organizer on learning meaningful verbal materials (Research Paper No. 24). Laboratory of Educational Research, University of Colorado, 1969.

Feller, W.A. The effects of two types of advance organizers and two types of spaced questions on the ability of a selected group of tenth grade biology students to recall, comprehend, and apply facts from written science material. (Doctoral dissertation, Temple University, 1973). Dissertation Abstracts International, 1974, 34, 1766A. (University Microfilms No. 73-33, 188).

Glass, G.V. Integrating findings: The meta-analysis of research. Review of Research in Education, 1978.

Lawton, J.T., & Wanska, S.K. Advance organizers as a teaching strategy: a reply to Barnes and Clawson. Review of Educational Research, 1977, 47, 233-244.

Scandura, J.M. & Wells, H.N. Advance organizers in learning abstract mathematics. American Educational Research Journal, 1967, 4, 295-301.

Smith, M.L. & Glass, G.V. Meta-Analysis of psychotherapy outcome studies. American Psychologist, 1977, 752-760.

TABLE 1

Mean and Standard Error of Effect Size for Advance Organizers on Learning and Retention

	Learning	Retention				
	0 - 1 Day	2 - 6 Days	7 Days	8 - 20 Days	21 Days	22+ Days
Number of Effect Sizes	110	8	17	8	9	8
Mean	.21	.19	.20	.23	.30	.38
Standard Error	.04	.15	.10	.16	.11	.16

TABLE 2

Mean and Standard Error of Effect Size for Advance Organizers on Learning and Retention When Studies Are Classified By Grade Level

	Learning			
	College (Grad & Under)	Secondary (Grades 9 - 12)	Primary (Grades 3 - 8)	Special Education
Number of Effect Sizes	40	36	30	4
Mean	.26	.17	.17	.28
Standard Error	.09	.06	.08	.12
	Retention			
	College (Grad & Under)	Secondary (Grades 9 - 12)	Primary (Grades 3 - 8)	Special Education
Number of Effect Sizes	20	20	10	0
Mean	.21	.26	.33	0
Standard Error	.08	.10	.14	0

TABLE 3

Mean and Standard Error of Effect Size for Advance Organizers on Learning and Retention When Studies Are Classified By Subject Area

	Learning			
	Mathematics	Physical Sciences	Biological Sciences	Social Sciences
Number of Effect Sizes	24	32	21	33
Mean	.10	.15	.11	.34
Standard Error	.09	.06	.07	.10
	Retention			
	Mathematics	Physical Sciences	Biological Sciences	Social Sciences
Number of Effect Sizes	13	8	15	14
Mean	.17	.50	.18	.26
Standard Error	.11	.18	.10	.09

TABLE 4

Mean and Standard Error of Effect Size for Advance Organizers on Learning When Studies Are Classified By Subject Ability

	Ability Level		
	High	Middle	Low
Number of Effect Sizes	26	9	29
Mean	.23	.08	.13
Standard Error	.16	.32	.09

TABLE 5

Mean and Standard Error of Effect Size for Advance Organizers on Learning When Studies Are Classified By Organizer Presentation Mode

	Presentation Mode	
	Written	Aural
Number of Effect Sizes	89	21
Mean	.17	.37
Standard Error	.04	.14

TABLE 6

Mean and Standard Error of Effect Size for Aural Advance Organizers on Learning When Studies Are Classified By Grade Level

	Grade Level			
	College (Grad & Under)	Secondary (Grades 9 - 12)	Primary (Grades 3 - 8)	Special Education
Number of Effect Sizes	6	6	8	1
Mean	.68	.11	.34	.37
Standard Error	.43	.07	.15	--